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JANUARY 28, 1950

SCIENCE NEWS LETTER

®

THE WEEKLY SUMMARY OF CURRENT SCIENCE

Mapping Field of Crystal

See Page 55

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MEDICINE

Artisone Aids Arthritis

► GOOD results with a new anti-arthritis drug closely related to cortisone but promising to be more plentiful were reported at a regional meeting of the American College of Physicians in Philadelphia.

Tried on 15 patients, the drug brought moderate improvement to three, marked to very marked improvement to nine, and failed to help three, Drs. Donald R. Fitch and Peter J. Warter of Hahnemann Medical College and Hospital and Dr. Joseph Seifter, director of the Wyeth Institute of Applied Biochemistry, reported. The three patients who did not respond to the drug were very advanced cases.

All improvements occurred "without side effects or the slightest evidence of toxicity" so far, the doctors reported. The drug has been given for a maximum period of 10 weeks to some patients.

The new drug has been named artisone by its manufacturers. It can "eventually" be made available in "very substantial

quantities" and large scale production is expected to reduce its cost.

The drug is a steroid chemical, like cortisone, but chemists identify it as delta 5, pregnene, 3 beta, 21 diol-20 one-21 monoacetate. Scientists who have studied the chemistry of cortisone will recognize that this new drug differs from cortisone chiefly in lacking oxygen at the eleventh position. They will be surprised because heretofore the oxygen at the eleventh position in cortisone's chemical structure has been considered the key to cortisone's activity.

Raw materials used as the starting point for artisone production come from the roots of wild Mexican plants known by the natives as "yams." Artisone was developed through collaborative research between the Wyeth Institute and the Research Laboratory of Syntex, S. A., Mexican manufacturers of steroid chemicals from vegetable sources.

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ENGINEERING

Car Industry Looks Ahead

► THE progress of the 50-year-old automobile industry was well illustrated at the General Motors "Midcentury Motorama," which opened recently with a preview for the press. Even more interesting than the 38 models of 1950 motor vehicles were evidences of even better cars in the future.

The automobile industry is definitely looking forward another half century. No decrease in highway transportation is expected in spite of increased use of airways. There may be little change in the outward looks of a car; the changes may be principally in construction materials and in mechanisms. Safety and economy are important considerations. The economy will come in operation and maintenance costs, not in first costs.

These Cadillacs, Buicks, Oldsmobiles, Pontiacs and Chevrolets displayed are the work of engineers. But behind the engineers are the scientists whose laboratory research is responsible for the high-strength alloys used in modern cars, the carburetor and ignition systems that assure reliable engine performance, the self-starter and high flash batteries that make winter starting almost a certainty and every other advancement in the car of today. These scientists are hard at work on advancements for tomorrow.

Some of the factors that will influence the car of the future were outlined by J. M. Crawford, vice-president of General Motors, in charge of engineering. So many "X" factors make up the equation of the future that the answer is necessarily vague, he said.

Form, shape and operation of future vehicles will depend on various inventions and manufacturing techniques that are bound to appear. Materials available will influence the future car. Also the industry must shape its plans and products to the country's economic trends.

Much future emphasis will be on engineering, because in some respects tomorrow's automobile will be more complex than today's. As an example, we have automatic transmissions that are highly refined mechanisms. So far as we can determine, they can not be simplified.

Although more expensive devices may be added to motorcars, the engineering emphasis of the future will be directed to more economical motoring, he declared. That may appear illogical, but the record shows that it is not. As an example he pointed out that one of General Motors' major projects is to get more work energy out of gasoline, more miles per gallon.

In an engine already tested, he stated, "we have found that by increasing compression ratio, the air-fuel 'squeeze' in the engine combustion chamber, and designing engines with reduced friction losses, we can travel from 30% to 40% farther on a gallon of gasoline."

To produce this extra mileage, the new engine will require 100 octane gasoline. Before the 12-to-one compression ratio engine can come into wide usage, this high octane gasoline must be available in a satisfactory commercial manner.

This is a problem for the oil industry. In all probability, according to Mr. Craw-

ford, the octane number of fuels will continue to rise gradually. As it rises, automobile engineers will be in a position to utilize such gains to the utmost. In other words, he added, we will build more octane numbers in engines.

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MEDICINE

Histamine Investigated As Cause of Leukemia

► IS histamine, the substance in the blood thought to be largely responsible for allergies, also the cause of leukemia?

Researchers at the Atomic Energy Project at the University of California at Los Angeles think it may be and are at work on this scientific "hunch".

Studies by Dr. William Valentine, Dr. Morten Pearce and Dr. John Lawrence of the U. C. L. A. Medical School staff show that blood histamine values are frequently elevated in certain forms of leukemia. The histamine is concentrated in the white blood cells, frequently present in increased numbers in leukemia.

In instances of a non-leukemia nature, however, where white blood cells are thrown into the blood stream in large quantities, the histamine content per cell is less than normal.

"Exactly what the relationship of histamine to leukemia is, we are not prepared to say just yet," Dr. Valentine emphasizes.

"Whether the increase in histamine contributes directly to leukemia or is merely the result of it has not yet been indicated by our experiments thus far."

The U. C. L. A. researchers are continuing their scientific detective work in the hope of establishing the relationship between histamine and leukemia.

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PHYSICS

One Million Degrees Is Sun's Temperature

► DIRECT confirmation of the sun's temperature as about 1,000,000 degrees Fahrenheit is reported in East Melbourne, Aust.

The definite proof of the sun's temperature was made through the study of solar radiation over a wide range of wavelengths. Previously, most observations of the sun's radiation have been either in the rather short or in the fairly long wavelength range.

The study was made by J. L. Pawsey and D. E. Yabsley of the Division of Radiophysics, Commonwealth Scientific and Industrial Research Organization. Against the steady background of radiation from the sun, they measured the variations that occur at all the wavelengths from one centimeter to four meters. This is in the range of Hertzian waves, between infrared and radio waves.

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CHEMISTRY

No. 97 Dubbed Berkelium

The new element berkelium is the heaviest one so far found. It was separated by a combination of precipitation and ion exchange absorption methods.

► CREATION of a new chemical element, No. 97, heaviest so far, has been accomplished in the 60-inch University of California cyclotron. The new element has been christened berkelium, and its symbol is Bk. It will have to be added to all tables of elements appearing in text books and elsewhere.

Production of this new element, artificially, has been predicted for several years. Four years of research led up to the discovery. Atomic Energy Commission support to the University of California radiation laboratory made possible the research.

The 241 isotope of americium, element no. 95, was irradiated with helium ions, resulting in the production of an isotope of element 97 which is 244 or 243 in atomic weight. The new element is short-lived. It decays by electron capture in a 4.5 hour half-life.

The new element is of no use in weapons production, the official announcement gave assurance. This is also presumably true with the next lighter elements, 95 and 96, although plutonium, which is 94, in one variety is the material of choice for the atomic fission bomb.

Element 97 was separated by a combination of precipitation and ion exchange absorption methods, making use of anticipated properties, including oxidation states and its position in the periodic table as a member of the actinide transition series. Its distinctive chemical properties and equally distinctive decay properties constitute the primary evidence for the creation of the new element.

By naming the new element after the city of its birth, Berkeley, the discoverers, Dr. Seaborg, Dr. Stanley G. Thompson and Dr. Albert Ghiorso, have followed the tradition of element naming contained in the periodic table of elements. No. 97 is in the same place in the actinide series of the table as No. 65 in what is called the lanthanide series. No. 65 is named terbium after the Swedish city, Ytterby, where Gadolin, a great investigator of rare earths, did his work. Actually four elements are named after this city. So it is in line to christen the new chemical baby berkelium, and the symbol will be Bk, since Be is already used for beryllium, No. 4, a light metal at the other end of the chemical scale.

There is every confidence that No. 98 will also be discovered or may even have already been discovered. The building of such heavy elements of fleeting life is one of the achievements of the giant accelerators

that can smack atomic particles into matter, making them stick together and thus transmute into elements never before made. Even heavier elements may be made in the future.

Nine chemical elements, five of them beyond uranium 92 and manufactured in Berkeley cyclotrons, have been discovered in the past dozen years. Besides 93, 94, 95, 96 and now 97, elements 43, 61, 85, and 87 have been discovered, largely as a by-product of the atomic research. The periodic table is now complete through No. 97.

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ICHTHYOLOGY

Extra-Boned Fish Due To Temperature Changes

► SHARP drops or rises in temperature cause trout eggs to develop into fish with extra backbone segments. Variant fish developed in this way experimentally correspond very closely to odd-boned sea trout found in regions where such heat changes could occur in nature.

These are the findings of Dr. A. Vedel Taning who is carrying out experiments on sea trout at the Marine Biological Laboratory at Charlottenlund Slot, near Copenhagen, Denmark.

Taking advantage of the fact, which he discovered in earlier work along the same line, that there is a brief moment during fish egg development when the embryo is supersensitive to heat changes, Dr. Taning subjected eggs to increases or decreases of 50 degrees Fahrenheit and higher. Eggs developing at medium temperatures were dropped way down to near freezing temperatures for about eight days, and then brought back to the original temperature. Those developing at near freezing were put in a warm environment for about 24 hours.

In both cases the young fish had extra spinal vertebrae, although the cold-treated ones had more than the heat-treated ones. The average increase was 3.2 over the 57 vertebrae of the parent fish.

Dr. Taning stresses the point that these changes are not inherited. Normally raised offspring will have the usual number of bones.

Similar variants occur at the southern boundary of the area where sea trout are found, for example in Italy. At the northern boundary, similar extra-boned trout are found.

Ordinarily the southern trout are con-

sidered to be a special species. In a preliminary announcement of his findings in the English journal NATURE (Jan. 7), Dr. Taning warns that classifiers who use bone counts to judge the species of fish should be careful to make sure that what looks like a different species is not actually just a heat-induced variant.

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CHEMISTRY

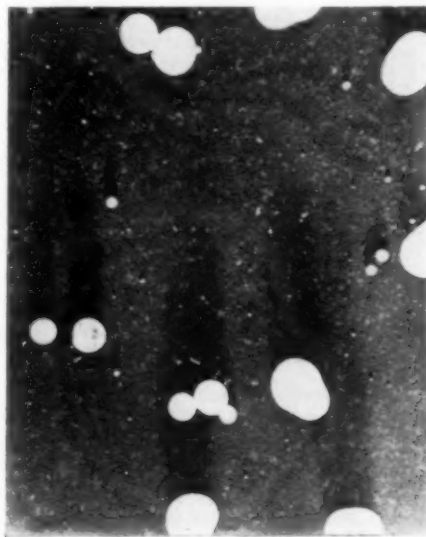
New Technique Promises More Molecule Knowledge

► BETTER understanding of large molecules, such as those in rubber, is promised from a technique developed in Kingsport, Tenn.

Use of an alloy of aluminum and beryllium when preparing samples to be studied in the electron microscope is said to do the trick. The method, particularly suitable for large particles, was developed by Wilbur Kaye of the Tennessee Eastman Corporation.

The alloy is used as the mounting surface for the sample that is being examined. Aluminum-beryllium is superior to the collodion or other materials commonly used for support of the specimen, it is claimed. This is because by "alloying these two light metals it is possible to reduce greatly the granularity of structure," Mr. Kaye states. He says that the alloy has advantages because of its high strength, good electrical conductivity, insolubility in nearly all solvents and low density.

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POLYSTYRENE PARTICLES —
Polymerized rubber molecules shown against a background of aluminum-beryllium alloy illustrate a new technique of preparing specimens for electron microscope studies.

AERONAUTICS-DEFENSE

Fast Aircraft for Defense

► SUPERIOR speed in military aircraft is essential to the success of air attack as well as air defense, Dr. Jerome C. Hunsaker, chairman of the National Advisory Committee for Aeronautics, states in the recently issued annual report of the committee to the President.

In an age of atomic bombs it appears that no nation can win a war without control of the air, he added. During the past year the NACA has directed much of its effort to solutions of the complex problems of high-speed flight. By the achievement of successful supersonic flight there was gained for America a substantial advantage in the race for air leadership.

Achievement of flight faster than sound by American research airplanes has given a strong stimulus to the design of very high speed aircraft both in this country and abroad. The NACA, he says, has evidence of increasing international competition in aeronautical research and development.

"The demonstrated possibility of supersonic flight is a significant turning point in aircraft performance," he declares. "For the future, we must accept the view that flight at supersonic speeds by practical military airplanes can be attained by any nation willing to make the effort.

"Notable during the past year," he continues, "has been the eagerness of aircraft designers to apply the new knowledge being obtained by the Committee's high-speed research program. Now that experimental supersonic flight has been attained, great efforts are being made by the Air Force and the Navy in fostering the design of operational and transonic and supersonic aircraft."

Entire credit for the achievement of supersonic flight should not be given to NACA, Dr. Hunsaker indicated.

"This gain was made through the co-

ordinated effort of scientists and engineers throughout the country—notably in the aircraft industry, the military establishment and NACA—supported by the work of educational institutions and other research agencies. The same teamwork is required to consolidate these gains and to push forward.

"The Congress has wisely provided for increasing the effectiveness of the team by authorizing the Unitary Wind Tunnel Plan for establishment of needed facilities for transonic and supersonic research, development, and evaluation. The Unitary Plan represents an extension of the teamwork, idea initiated by the cooperative military-industry—NACA research-airplane program that lead to achievement of supersonic flight."

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MEDICINE

Dramamine Used by Window Operation Patients

► A NEW use for dramamine, the chemical that both prevents and relieves motion sickness, has been discovered. This is for patients who have had the so-called window operation to cure deafness.

The operation is not suitable for all types of deafness. But in those on whom it is performed, vertigo, nausea and vomiting are troublesome complications during the first two days after the operation and patients have much nausea and occasional vomiting even after the first 48 hours. Vertigo is the sensation of things revolving around you or of yourself revolving in space.

When dramamine was given to 28 patients undergoing this operation, 12 had occasional slight attacks of vertigo and 10 had occasional nausea. None had vomiting.

When the dramamine was stopped, eight relapsed, but recovered immediately after a dose of the drug.

The trial of dramamine in this condition was made by Dr. Edward H. Campbell of the Graduate School of Medicine, University of Pennsylvania. The results were included in a report to the American Medical Association meeting in Washington, D. C., by Drs. Leslie N. Gay and Paul E. Carliner of Johns Hopkins University School of Medicine who were the discoverers of dramamine's anti-motion sickness effects.

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MINING

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MINING

Fuel from Oil Shale

Scotland is now in its one hundredth year of crude oil production from shale. America entered this production late because the U. S. has had much natural petroleum.

➤ SCOTLAND next July will celebrate the hundredth anniversary of its oil-shale industry, and its production has been continuous during this period. Dr. Simon Klosky, oil-shale chemist of the U. S. Bureau of Mines, stated in Washington, D. C.

Dr. Klosky spoke as guest of Watson Davis, director of Science Service, on Adventures in Science, heard over the Columbia Broadcasting System. He reviewed the production of gasoline and heating oils from shale in Western Europe, giving information acquired during a recent inspection trip.

"In this 100 years of the Scottish oil-shale industry, it has had many ups and downs," he stated. "From a flourishing start in 1850, to a temporary depression around 1880 due to importation of American petroleum, it passed to a relatively steady existence, relieved only by the demands for more liquid fuel products brought on by the two world wars."

He described a process in Sweden by which petroleum vapors and gases are obtained without mining the shale. Holes are drilled deep into the earth and into the natural layers of shale, and electric heating elements are lowered in the holes. After weeks of heating, petroleum vapors are collected from other holes. The process, he said, seems practical where plenty of cheap electricity from hydroelectric plants is available, and the price of gasoline is relatively high.

Three plants in France, visited by Dr. Klosky, were described. One has been in operation since about 1880. This refinery was operated with great difficulty during the recent German occupation, but "it managed to keep going and to sequester enough of its products to refuel American combat tanks when they arrived."

Although unable to visit oil-shale industry behind the Iron Curtain, information on Estonian and Russian reserves was obtained by other means. Estonia in prewar days produced more crude oil from shale than any other country, and Russia produced almost an equal quantity. Estonian shale deposits extend eastward well into Russia proper, and the Soviets have large deposits on the Volga river and in other places.

America's entrance into the production of oil from its vast deposits was delayed behind European activities merely because the United States had vast quantities of natural petroleum. Now the point has been reached where liquid fuels from petroleum

must soon be supplemented by synthetic fuels from coal and oil-shale. Dr. Klosky described two plants of the U. S. Bureau of Mines now in operation, the plant at Louisiana, Mo., for production from coal, and the plant at Rifle, Colo., where liquid fuels from oil shale are now successfully extracted.

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METEOROLOGY

Skyhooks of Plastic Aid Weather Forecasts

➤ TO help forecast weather for airways and ground-dwellers alike, giant balloons—skyhooks they are called—will be floating about 20 miles high over the oceans when plans being made in Washington, D. C., are materialized.

Made of a new plastic, polyethylene, and standing 129 feet high when inflated, the outsize, tear-drop-shaped balloon has been

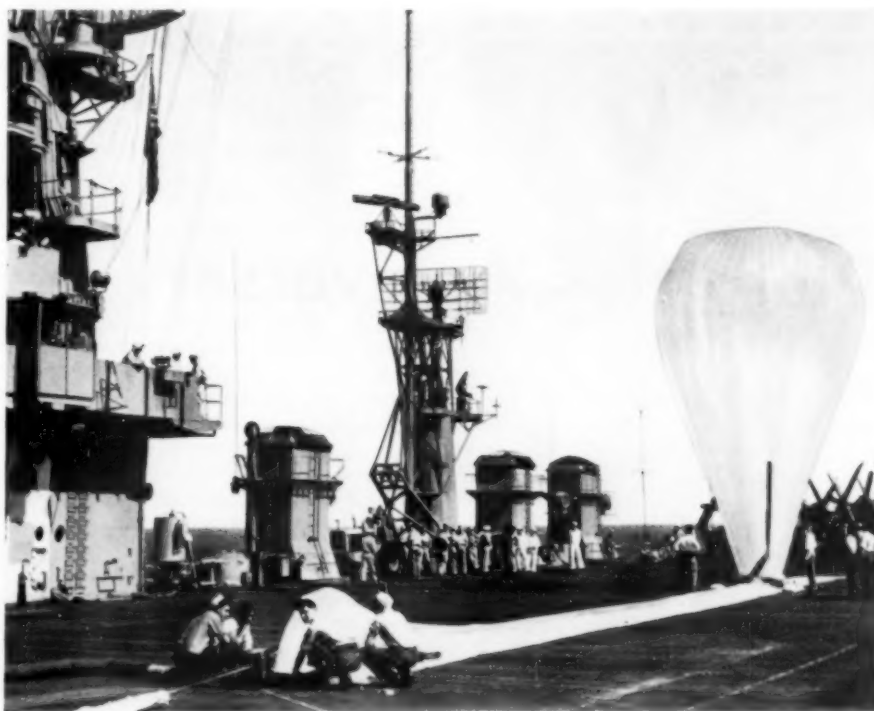
developed by the U. S. Navy for use in catching cosmic rays and observing the sun's spectrum from outside most of the earth's atmosphere.

Its ability to drift with air currents at constant heights well suits the skyhook to weather observation needs, Earl G. Driesler, Office of Naval Research meteorologist, told the American Meteorological Society. It can lift about 80 pounds of recording and transmitting equipment. Its path can be tracked with radar, and being large, it can also be followed visually to great heights.

The disadvantage of balloons commonly used today is that they do not stay at one altitude, and to arrive at weather readings for a given level it is necessary to approximate the information by interpolation.

By increasing the balloon's payload, which can be accomplished by using the balloons in clusters, he foresaw that the recently proposed scheme to adapt the skyhook balloon to a trans-ocean weather observation network might become a reality.

The trans-ocean-sounding system referred to was proposed by Capt. Howard T. Orville of the Office of Naval Research, ex-president of the American Meteorological Society. Capt. Orville suggested that the skyhooks be rigged to drop 'chute-born radiosonde equipment at timed intervals over the ocean to transmit a set schedule



"OPERATION SKYHOOK"—High-altitude plastic balloon which reaches 18 to 20 mile heights is being readied for ascent on the flight deck of USS SAIPAN during recent cosmic ray tests in the Caribbean. When the balloon is full, it stands 129 feet tall or about as high as a 12 story building.

of weather messages to shore listening posts.

Mr. Droessler said that to put such a network into regular routine operation might take as much as five or ten years

more research and development. But he was sure that the new balloon was well suited to the job and could "provide the proper airlift."

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GEOGRAPHY

South Americans Migrate

► THOUSANDS of South Americans are now taking part in a migration to the east comparable to the great drive to the west of United States history.

The landless citizens of Venezuela, Colombia, Ecuador, Peru and Bolivia are moving several hundred miles eastward across two mountain chains from the worn-out plateau lands of those countries, Dr. Raymond Crist, professor of geography at the University of Maryland stated.

Taking all they possess with them, including some cattle, they are "home-steading" in the tropical forest regions east of the Andes and in the headwaters of the Orinoco, Amazon and Madeira Rivers.

These regions, Dr. Crist said, were uninhabited 20 or 30 years ago. Now frontier towns of up to 10,000 in population have been built up. The new town of Via Vicenzio in eastern Colombia even has seven or eight rice mills established.

The pioneers are leaving lands which have either been worn out by too intensive agriculture or are incorporated in great estates and thus have not been cultivated intensively enough, Dr. Crist said. The land to which they are migrating, he explained, is almost all government-owned and thus is free for settling.

All five countries are taking a great in-

terest in this migration and have begun to build roads eastward over the mountains. Now, some of the migrating is done by bus, but many still are walking over the Andes to new homes every year.

Dr. Crist, an expert on South American cultural geography, recently returned from a six-month assignment by the Smithsonian Institution to the Universidad del Cauca in Popayan, Colombia. He has traveled in all five of the countries involved many times before.

"It is my opinion that this surge eastward," said Dr. Crist, "will continue and grow. There is great demographic pressure on these people to move away from their plateaus and in most instances they can't move to the west."

Most of the pioneers are farming or raising cattle. Their crops are for the most part corn and coffee. Cheese comes from a breed of white cattle which gets on well in the tropics and which many of the people brought with them.

Dr. Crist said that there was no similar movement of Brazilians westward to the headwaters of the three rivers. Brazilians, he explained, are migrating more in a southwesterly direction.

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ASTRONOMY

Pluto Has Anniversary

► THE 20th anniversary of the discovery of the planet Pluto occurred Jan. 21. It was from a photograph taken on this day in 1930 that Pluto was recognized, by a 23-year-old astronomer named Clyde Tombaugh, poring over photographs of the heavens at the Lowell Observatory in Arizona.

But the man who had predicted the existence of the planet, who, in fact, had told the scientific world almost exactly where it would be, and who spent many years searching for it, was dead. He was Prof. Percival Lowell, brother of President A. Lawrence Lowell of Harvard. In 1915, one year before his death, he published a paper in which he deduced the existence of Pluto from deviations in the orbits of two other planets, Neptune and Uranus. Prof. Lowell said that these deviations were caused by the gravitational pull of an un-

discovered planet. And he was even able to figure out the probable path around the sun of this heavenly body.

Pluto is too far away to be seen with the unaided eye and it was not until the Harvard Lowell donated a special 13-inch photographic telescope that Pluto was discovered.

When Mr. Tombaugh finally took a picture of the new planet and identified it as such, a search was made of pictures taken along the orbit of Pluto at the Lowell Observatory before Percival Lowell died. Ironically enough, there was Pluto's picture, on photographs which Prof. Lowell might have seen.

The search for Pluto went on at many observatories for years after Prof. Lowell made his prediction. Mr. Tombaugh started looking in March, 1929. It was a laborious task. He had to take hundreds of pictures

of more than 2,000,000 stars before he finally found Pluto.

The actual discovery of Pluto was a matter of getting the planet to wink at him. Planets, moving in orbits, are always in different positions in relations to the stars. Mr. Tombaugh shot his telescope camera in the general direction of the orbit predicted for the new planet by Prof. Lowell. Then he would take two pictures, made on different nights and place them in a "blink microscope." This was a stereopticon-like machine, which superimposed one picture over the other.

The blink microscope, operated rapidly, could turn first one picture on, then the other. Mr. Tombaugh would get what looked like a continuous image of all the stars. If he got something winking or blinking at him, he would know he had something.

It was on Feb. 18 that he got his first wink, while looking at two plates taken on Jan. 23 and Jan. 28. He immediately checked with two plates taken on Jan. 21—20 years ago—and there was the new planet, sharply defined.

Announcement of the discovery was held up until March 13, 1930, the anniversary of Prof. Lowell's birth. That day was also the anniversary of the discovery, in 1781, of the planet Uranus by William Herschel, then a musician of Bath, England.

A few months later, the new planet was given its name. Pluto was suggested to the professor of astronomy at Oxford by an 11-year-old English girl. The choice of the name is particularly appropriate because the first two letters are the initials of Percival Lowell.

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TEXTILE ENGINEERING

Improved Cottons Compete With Synthetic Fibers

► KING cotton, whose empire was shaken by the cellulose revolution that brought rayon into high public favor, is making a bid to win back some of its competitive advantage with the development of new strong-fiber varieties.

Years of plant breeding and research have produced several new types with a much higher fiber strength than any cotton now grown. Thanks to these improved types, cotton can now compete more favorably with the synthetic fibers, states Dr. Charles R. Sayre, a Department of Agriculture research head.

Some of the varieties are so new they have not yet been released, but several including two American-Egyptian hybrids and a high-test-fiber Asiatic-American cross are available commercially.

The new cottons, by providing better cotton at lower costs, may supply the key to more varied and efficient farming in cotton growing areas, he said.

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CHEMISTRY

New Crystals Replace Old

Barium titanate crystals which have the property of ferro-electricity will be used in sound and ultrasonic equipment. Only pinhead size crystals have been formed.

See Front Cover

► BARIUM titanate, a war-developed material with exceptional electrical behavior, will be replacing other crystals in submarine sound detection, and in other sound and ultrasonic equipment.

Some scientists expect that the future development of somewhat similar exceptional materials may lead to more effective electrical storage devices.

Barium titanate when treated as a ceramic, or clay-like material, looks very much like the porcelain of your kitchen sink. And it can be made in extremely thin slices needed for condensers.

At this time, scientists will admit only to pinhead size for the crystal form of barium titanate. Efforts are being made to grow crystals that are much larger.

The sensitive atoms of barium titanate show a remarkably quick response to the slightest changes in pressure, temperature or electrical field. Even light, shining on a crystal of it, will cause the atoms to rearrange themselves.

Scientists at the Massachusetts Institute of Technology, at the National Bureau of Standards, at Bell Telephone Laboratories, and in England, Holland and Russia among other countries, are busy investigating the properties of barium titanate and related compounds.

Reason for all this intense interest is that these materials have the property known as ferro-electricity. Only two other groups of compounds are known that exhibit this property. They are the Rochelle salts and the potassium dihydrogen phosphates.

The discovery of a group of materials so far superior in their electrical behavior to any compounds yet known is as important in the electrical field as the discovery of a new class of materials that would behave as iron does in the magnetic field.

Recognition of the far-reaching effects of the new class of materials was seen in the award of the Stalin Prize of Physics in 1946 to Prof. Bentsion Vul, then head of the laboratory of dielectrics in the Institute of Physics of the USSR Academy of Sciences.

Ability to increase to an exceptionally high degree the electrical capacity of charged plates is one of barium titanate's important characteristics. Physicists speak of this ability as the material's dielectric constant. Some estimates have placed the dielectric constant for barium titanate as high as 5,000, compared with about seven

for mica. These figures are based on air having a numerical value of one.

Certain materials, called piezo-electric, will develop an electrical charge when their dimensions are changed. This would happen, for instance, when they were bent or pressed mechanically. These same materials will, conversely, change shape when they are placed in an electrical field.

It is this change in shape that makes possible the playing of a phonograph record. Here, the very tiny indentations in the groove of the record are picked up through the needle and sent back to the piezo-electric crystal. This causes a small change in the shape of the crystal. The electrical charge thus developed is amplified and comes out of the loudspeaker as sound.

Ordinarily Rochelle salts are used for this pick-up crystal, since they undergo electrical change with shape. The drawback is, however, that they lose some of this property on a very hot day, when the temperature is about 86 degrees Fahrenheit. Rochelle crystals are also very soluble in water.

Both of these difficulties are overcome in the barium titanate and related-type crystals. Experiments have shown that barium titanate does not lose its sensitivity until the temperature is well over 250 degrees Fahrenheit. Nor does it dissolve in water.

How powerful is the electric field of barium titanate can be seen on this week's cover of the SCIENCE NEWS LETTER. The electric field near the edge of the barium titanate crystal (black portion) distorts the shadow of the background screen of the electron microscope.

First hint of the unusual properties of barium titanate came from the Titanium Alloy Manufacturing Company of Buffalo, N. Y. They were investigating materials suitable for use in condensers, vitally needed for the war effort. Quartz and mica, the two most commonly used materials, were in extremely short supply. Development of barium titanate suitable for commercial use in condensers did not come until late in the war effort.

Physicists at MIT, upon hearing of the exceptional qualities of barium titanate, started an investigation of its atomic structure. This was in an effort to understand why it had such an unusual behavior in an electrical field.

Dr. Shepard Roberts, now at the Research Laboratory of General Electric Company, was the first to discover the ferro-electric

properties of barium titanate. War-time research at MIT was led by Dr. A. von Hippel, working in cooperation with Drs. R. G. Breckenridge, F. G. Chesley and Laszlo Tisza.

Dr. B. T. Matthias, who started his investigations of the compound in Switzerland and continued them at MIT, is spearheading the work at Bell Telephone Laboratories.

Science News Letter, January 28, 1950

SAFETY

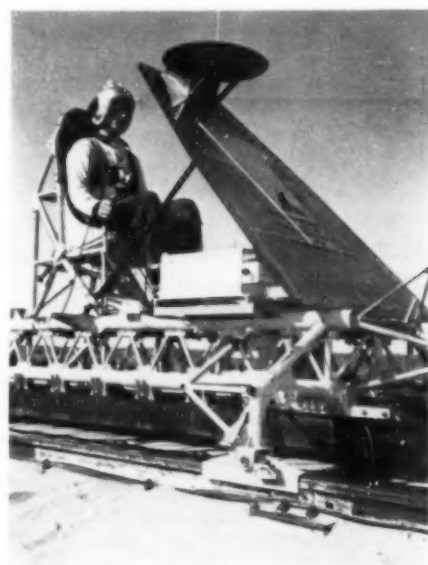
Auto Skidding Tests on Ice and Snow Are Underway

► THE frozen surface of Pine Lake in Clintonville, Wis., and hard-packed snow on neighboring roads, are now in use by a party of about 50 engineers conducting two weeks of testing of automobile skidding and traction.

The scientists are from all parts of the United States. They are members of a special committee of the National Safety Council on winter driving hazards. Ross G. Wilcox of this organization is in charge. The purpose is to determine the facts about the value of winter tire treads and special winter retreads, and also of skid chains and driving techniques.

Somewhat similar tests have been made in previous years. Lessons learned by these experts, passed on to the public, are expected to prevent skid-wrecks and traffic tie-ups which cost the American driving public many millions of dollars each year.

Science News Letter, January 28, 1950



DECELERATOR RIDE—An Air Force volunteer awaits the firing of the rockets for another jolting decelerator ride. The disk at the upper edge of the windshield supports a telemetering antenna, which broadcasts signals denoting the volunteer's reactions during decelerator experiments.

ENGINEERING

Steel "Parallelograms" Form Giant Sphere

► TWENTY steel "parallelograms" were fitted together like a global jigsaw puzzle to build the giant sphere in use by the U. S. Navy at Carderock, Md., in connection with a wind tunnel. Former pieces used in building oil, gas and other spherical tanks were fabricated of "orange peel" sections.

This radical new method of shaping steel pieces to fit together into a sphere is the work of scientists at Mellon Institute, working under the auspices of the Pittsburgh-Des Moines Steel Company. It saves both labor and cost in rounded steel construction.

In the process employed, a small plastic sphere was molded in a wooden form. This was then cut into parallelograms, four-sided geometric figures with parallel sides but not necessarily of equal angles. These cutout sections were flattened by a heat lamp. They then became a "dressmaker's pattern" for economically tracing on flat steel the exact design to cover a sphere.

In constructing the 32-foot vacuum tank at Carderock, known as an Icosasphere, thousands of dollars were saved by this new layout method, it is claimed. It was erected by the Pittsburgh-Des Moines Steel Company. The Icosasphere is the invention of J. O. Jackson of that company.

The giant sphere was erected in half the time anticipated for a globe of its size. It reduced the usual welding requirements by one-third, and cut in half the amount of steel usually wasted in scrap. This same method may be applied in cutting steel sections for submarine and steamship hulls, rockets, domes and other double-rounded bodies.

Science News Letter, January 28, 1950

FOOD

Harmful Effects of Chemicals Investigated

► THE poisonous or harmful effects of over 125 chemical compounds sprayed on fruits and vegetables are being scrutinized by a long stream of technical experts at Food and Drug Administration hearings in Washington, D. C.

The compounds include DDT, 2,4-D, lindane, parathion, and all the other insecticides, herbicides, and fungicides developed since the beginning of the war.

Farmer, government, and manufacturing groups will all present their views on the effects on humans of these insect- and weed-killing poisons. The hearing is considered to be one of the most thoroughgoing efforts ever made to safeguard the nation's health.

Not since the protracted hearings on lead arsenate—DDT's predecessor—a generation and more ago, has there been such

a large-scale attempt to insure the public against harmful quantities of the bug-killing poisons.

The hearings will last, according to various estimates, from two to four months, although some observers predict they will drag on for a year or even more.

The first witness was the Department of Agriculture. The principal argument stressed was the necessity for using poisonous compounds in order to keep down the insects and other pests, so that the needed food can be raised in the required quantities.

All interested forces in the multi-billion dollar fruit and vegetable industry will have an opportunity to testify. Chemical manufacturers, farmers, federal and state agricultural scientists will weigh the relative merits and dangers.

The final upshot of the hearings, which will sift every phase of the matter from how much spray is used to ways of washing it off before the produce is sold, will be a set of rules which will govern the permissible residues on fruit and vegetables transported in interstate commerce.

Science News Letter, January 28, 1950

ENGINEERING

Mercury Vapor and Steam Power Turbines, Save Fuel

► MERCURY vapor and steam will power turbines in a new electric plant built to increase the amount of electricity available to the State of New Hampshire. Steam turbine engines are common; mercury vapor turbines less known. In this case the two are combined to provide an economical fuel-saving plant.

The new station, opened by the Public Service Company of New Hampshire, is equipped with two 7,500-kilowatt mercury-turbine generators and a 25,000-kilowatt steam turbine generator. Steam for the latter comes from the mercury vapor which has done its work in turning the shafts of the mercury turbines.

In operation liquid mercury is vaporized by heat from boiler furnaces and the vapor is used to drive the two mercury-turbines, acting in about the same way as in other gas turbine engines. After the mercury vapor has passed through the turbines, it is piped into condenser-boilers where it gives off enough latent heat in its conversion from a gaseous to a liquid condition to turn water into steam. This steam drives the steam turbine.

Heat for the mercury boiler furnaces can be supplied by the burning of either pulverized coal or by the lowest commercial grade of fuel oil. The equipment will be able to produce more electricity with a given amount of fuel than any generating equipment of comparable size yet built, it is claimed. The mercury vapor and steam driven turbine generators were built by General Electric.

Science News Letter, January 28, 1950

IN SCIENCE

ENGINEERING

New Phonograph Needle Plays Any Speed Records

► A NEW phonograph needle, which will be "in the groove" on all kinds and speeds of records will shortly be on the market.

The new needle can be used on any kind of commercial record now made. It takes advantage of the fact that the sound can be picked up from the sides of the grooves and the needle does not have to be right down in the bottom.

Invented by John D. Reid of the Avco Manufacturing Corporation, Cincinnati, Ohio, the needle is being manufactured by the Vallards Jewel Company, Lancaster, Pa. The work was reported in JOURNAL OF ACOUSTICAL SOCIETY OF AMERICA (Nov. 1949).

Record-producing companies have not standardized the depth or width of their grooves, nor the angle at which they are cut.

On a machine that would play all three speeds of records, it was sometimes necessary to change the needle every time the speed was changed.

The needle has a blunt tip, one so blunt that its angle is greater than the angle of any groove now being made. While it hits the sides of all grooves, it never touches bottom in any groove.

In various kinds of grooves different parts of the surface of the needle come in contact with the record. This results in less wear. Since a fine point is not needed, there is no danger of breaking the tip.

Science News Letter, January 28, 1950

PHYSICS

Atom's Energy May Be Measured More Accurately

► MORE accurate measurement of the energy inside an atom can be made as a result of experiments with the cyclotron at the University of California in Los Angeles, Calif.

John Teasdale, graduate student in physics at U. C. L. A., has worked out a method of determining how much energy a proton loses as it shoots through varying thicknesses of different metals. Since many instruments used in nuclear studies require metal foils, it is important to know the energy loss to the proton as it passes through the metal.

Mr. Teasdale's method is to vary the thickness of two stacks of metal foils until each produces the same energy loss when inserted into the proton beams.

Science News Letter, January 28, 1950

ENGINE FIELDS

ENGINEERING

Transmitter-Receiver To Help Save Ditched Pilots

► A TINY radio transmitter-receiver, for use by ditched airplane pilots in lifeboats or lifebelts in the ocean, is small enough to hold in one hand and is powered with a miniature battery carried in a pocket. It is a development of the U. S. Air Force at Wright-Patterson Base, Dayton, Ohio.

This small, lightweight radio lifesaver is designed to replace the 40-pound set used during the war, known as the "Gibson Girl." It has now been thoroughly tested and will soon become standard equipment for all Air Force pilots and airmen. Tests show that its signals have a pick-up range of 80 miles, and that it is little affected by temperature changes.

The device operates on two channels, very high frequency and ultra high-frequency, and can be switched from one to the other instantaneously. It is able to transmit and receive both voice and code signals. Its miniature, mercury-type battery will not deteriorate with lack of use or with age. The entire unit is completely impervious to salt water.

The new equipment is already in production in Los Angeles by the Hoffman Radio Corporation. Engineers of this company collaborated with the Air Force in its development.

Science News Letter, January 28, 1950

SEISMOLOGY

Discrepancy in Speed of Shock Waves Explained

► A NEW theory of the structure of the earth's crust which may explain away a discrepancy that has puzzled earthquake experts, has recently been suggested by Prof. Beno Gutenberg of the California Institute of Technology.

The discrepancy crops up in an apparent difference of speed between shock waves from artificial explosions and those set off by natural earth tremors.

After setting off artificial explosions and carefully comparing wave velocities with earthquake readings, Prof. Gutenberg has come to the tentative conclusion that about nine miles (15 kilometers) beneath the earth's surface there is a layer of rock which slows down the speed of shock waves. Present theory holds that wave velocity increases with depth.

On the basis of limited experiments so far, Prof. Gutenberg finds that his hypothesis seems to eliminate the velocity spread between natural and artificial shocks.

The exact significance of the new theory

is not yet clear since it will require more detailed comparisons to see if it fits all cases. It suggests that there may be a layer of rock of a still undetermined nature which causes the waves to slow down.

The slow speed layer would act in such a way, Prof. Gutenberg says, that its existence could not be detected by refracted waves from artificial explosions.

When asked if the new theory would change our ideas of structure of the earth, one of Prof. Gutenberg's colleagues said, "No, it will not, for the simple reason that what we know about the structure of the earth is next to nothing."

Prof. Gutenberg announced his theory in the journal, *SCIENCE* (Jan. 13).

Science News Letter, January 28, 1950

MINING-INDUSTRY

New Mexico Coking Coal To Aid Western Industry

► COKING coal, recently discovered in New Mexico, can easily be made available for western industries, the U. S. Geological Survey revealed. It is an important discovery because little coal suitable for making coke is found in the West.

In a recent survey of New Mexico by the government office, the state is found to have more than 60,000,000,000 tons of coal, some suitable for coking. Included are 50,000,000,000 tons of sub-bituminous coal in beds more than 30 inches thick, and nearly 11,000,000,000 tons of bituminous and small amounts of anthracite in beds more than 14 inches thick. All are less than 3,000 feet from the surface.

A preliminary table showing the summary results of the survey is available without cost from the Geological Survey. The title is "Estimated Original Coal Reserves in New Mexico."

Science News Letter, January 28, 1950

MEDICINE

Diphtheria Germs Contain Protein-Building Chemical

► DISCOVERY, in diphtheria germs, of a hitherto unknown protein-building chemical is announced by Dr. Elizabeth Work of University College Hospital Medical School in London.

The chemical is an amino acid. Its name is diaminopimelic acid. Its properties correspond closely, Dr. Work reports, to a diaminopimelic acid that was made synthetically in 1908, but this is the first time it has been discovered in nature. Dr. Work thinks many other bacteria besides the diphtheria germ may have this acid in them. In the diphtheria germ, it is probably a constituent of the germ's protein. Dr. Work reported her discovery in the journal, *NATURE* (Jan. 14).

Science News Letter, January 28, 1950

CONSERVATION

Hybrid Pines Promise To Replenish Forests

► A PREDICTION that fast-growing hybrid pine trees will do as much for America's depleted forests as hybrid corn has done for the American farmer was made by Victor H. Schoffelmayer, agricultural consultant of the Southwest Research Institute and president of the Texas Chemurgic Council.

Seedlings of hybrid pine, product of 20 years' research, will outgrow the parent tree "by 100 to 300 percent in height and more than that in volume in a given time," he told the winter meeting of the Southern Association of Science and Industry.

Waiting for nature to reforest burnt-out or cut-over areas will not do the job, he said. Man must step in with his scientific knowledge of plants and his methods of reseedling which are quicker and more efficient than nature's way, he said.

Science News Letter, January 28, 1950

ENGINEERING

New Construction Method Claimed to Cut Costs

► A NEW method of construction using reinforced concrete slabs, to be employed in erecting an administration building at Trinity University, San Antonio, Texas, will save about 10% in costs over older conventional methods.

Construction bids already received from contractors indicate this saving. The new method is called the Youtz-Slick process after its originators, Philip N. Youtz, New York architect, and Tom Slick, a San Antonio business man. Development of the method was carried out at the Institute of Inventive Research, San Antonio, Texas.

The secret of the saving comes from the use of the floor slab for a casting form. This eliminates the necessity of erecting conventional forms for each floor. When poured and cured, the upper floors are raised to position by special machinery.

As described by William J. Lance, of the Institute staff, "foundations are poured in place and followed by the pouring of a base slab. Columns of pipe, structural steel or concrete are then placed, anchored and grouted. The roof slab, or the second floor and roof slabs if the building is two-story, is laid on the base slab which is used as a bottom form, thereby requiring only edge forms.

"Concrete is then poured directly on the base slab over a separating medium and allowed to cure for at least seven days. Specially designed lifting equipment is placed on the columns and attached to the slab. The slab is then raised to its permanent position and welded to the column by means of a collar which was placed in the slab at the time of pouring."

Science News Letter, January 28, 1950

ASTRONOMY

Saturn and Mars Appear

Two planets, one of which has not been seen in the evening sky for over a year, join the bright stars of February evenings. Sirius is the brightest of the stars.

By JAMES STOKLEY

➤ JOINING the bright stars visible on a February evening, this month we have two planets in addition. One of them is Mars, which has not been seen in the evening sky for more than a year. The other is Saturn, and both are indicated on our accompanying maps, which give the appearance of the sky about 10:00 p. m., your own kind of standard time, at the first of February. By the middle of the month, it will look the same way an hour earlier, while at the beginning of March this will be their arrangement about eight o'clock.

Mars just about rises in time to be shown, and unless you have a clear view low in the east, it may be difficult to find it until still later in the evening. Saturn is higher than Mars, and not as bright, though both are more brilliant than most of the surrounding stars.

Sirius and Orion Bright

Of them, the brightest is Sirius, the dog star, in the constellation of Canis Major, the great dog, which we see in the south. This, in fact, is the brightest star in the sky, with the exception, of course, of one that we see in the daytime, which we call the sun!

Above and to the right of Sirius is Orion, a figure representing a great warrior. There are three stars in a row which form his belt. Above are two stars, Betelgeuse and Bellatrix, which indicate the shoulders. Below the belt is Rigel, which is one of his feet, supposed to be upraised. Still higher than Orion, and farther right, we come to Taurus, the bull, which is charging toward the warrior. Aldebaran, a star that is distinctly red in color, marks one of the animal's eyes. It is in a V-shaped group of stars called the Hyades, while another, and still better-known, little group is farther right, in the bull's shoulder. These are the Pleiades—the seven sisters of mythology—which appear as a hazy little patch to the naked eye.

Canis Major is not Orion's only dog, for higher in the south we find Canis Minor, the lesser dog, of which Procyon is the most conspicuous star. And above Procyon are Gemini, the twins, of which the principal stars are Castor and Pollux, the latter being brighter. Still higher, indeed practically overhead, stands Auriga, the charioteer, in which there is another star of the first astronomical magnitude. This is called Capella. Another bright star can be ob-

served over in the eastern sky, above Saturn. This is Regulus, which is part of the constellation of Leo, the lion.

Fainter Stars

Among the stars that are fainter, but still are easily located, we find those making up the familiar figure of the greater dipper in the northeast, with the handle hanging downwards. These stars are actually part of the constellation of Ursa Major, the great bear. The two stars at the top of the dipper are the pointers, which show the direction of Polaris, the pole star, over to the left and in the figure of Ursa Minor, the lesser bear.

In the northwest Cassiopeia, the queen, can be discerned, while lower in the sky is Cepheus, the king. Above Cassiopeia is Perseus, the great champion, in which Algol, the "demon star," blinks. This is a well-known eclipsing variable, with a darker star coming in front of a brighter one every 2 days 21 hours. Those diminutions in light which occur during evening hours are given in the Celestial Time Table at the end of this article.

Between Gemini and Leo stands Cancer, the crab, which is one of the fainter constellations of the zodiac, the path of the sun, moon and planets. Below Cancer, is Hydra, the water-serpent, a long line-up of stars that does suggest a snake of some kind.

Positions of Other Planets

As for the other planets, Jupiter, which has been so bright in the evening sky in recent months, is now so nearly in line with the sun that it is invisible. Venus, which was still brighter and passed Jupiter in the western evening sky early in Decem-

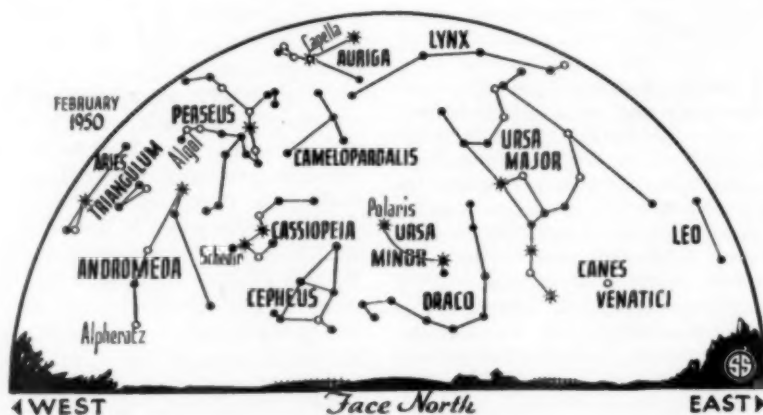
ber, has now gone to the other side of the sun, and can be seen in the morning sky, low in the east just before dawn. It is in the constellation of Capricornus. About Feb. 10 Mercury will be farthest west of the sun, and it too will be seen low in the east at dawn. Venus will be many times brighter than Mercury, and may be followed into the daytime sky.

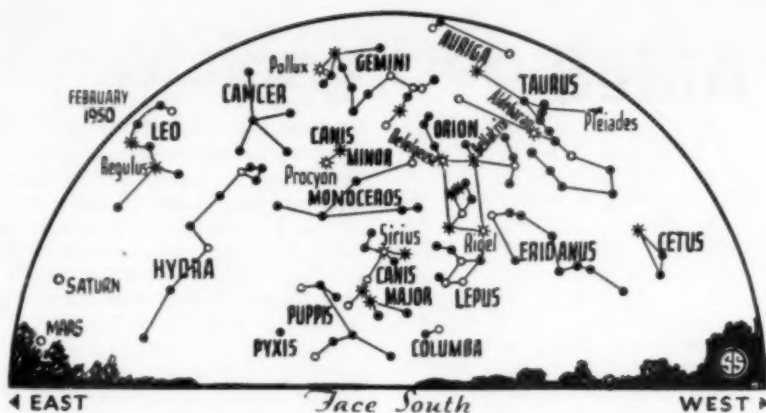
More Stars Photographed

As noted above, Sirius is the brightest star that we can see in the nighttime sky, and from this we go to the faintest stars visible to the unaided eye, on a dark clear night. This is a range of brightness of nearly a thousand times. But even stars of the fifth magnitude—the faintest we can see without a telescope—are many times brighter than most of those observed by astronomers. There are about 5,000 stars of naked eye brightness, but we can only see half the sky at once. Even of those that are above the horizon, it is only when they are far above the horizon that they appear most brightly, and some 2,000 is about the most that are ever visible at once.

With the 100-inch telescope at Mt. Wilson it is possible to photograph stars down to about the 21st magnitude. This is about a millionth as bright as one that we can just see under ordinary conditions. There are about a billion stars within reach of the 100-inch instrument, while the new 200-inch, recently placed in operation at Mt. Palomar in southern California, will go about a magnitude farther. This will add approximately another billion stars to those within reach of astronomers. However, as there are an estimated 30,000,000,000 in our own system, the Galaxy, there is still room for plenty of further advance. And in addition, beyond the limits of our own Galaxy, there are millions of others, each made of millions or billions of stars.

There are two reasons for variation in the brightness of stars. They may actually be of different luminosity, or candlepower, just as a 100-watt lamp is brighter than





◊ * ◐ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

one of 15 watts. But if we compare two 100-watt lamps, one a few feet away and the other at a distance of a mile, the latter looks fainter because it is so much farther away. The same thing is true of the stars. The sun is a star, similar to those we see at night, but it seems so bright because it is not far away, only about 93,000,000 miles, which is right on our door-step, astronomically speaking. Sirius is at a distance of about 52,000,000,000 miles, and looks about one ten-billionth as bright. However, the sun itself at the same distance would look still fainter, for Sirius is actually about 27 times the sun's luminosity. Since it is only about 80% larger than the sun in diameter, its surface area is about ten times as great. Therefore, each square inch of the surface of Sirius must emit more light than a square inch on the sun, which means that its surface temperature must be higher. Astronomical studies show that it is—nearly twice as hot as the sun, which is around 11,000 degrees Fahrenheit.

Rigel Is Luminous

Of the conspicuous stars, one of the most luminous is Rigel, in Orion. As we see them in the sky, Rigel looks about a sixth as bright as Sirius, yet measures of its distance show it to be at 540 light years, or about 63 times as far. Its luminosity is about 18,000 times as much as the sun's. It is a little hotter than Sirius, but far bigger, with a diameter about 42 times

that of the sun. Thus, there is much more of Rigel to shine, and that is why it is so brilliant. Even this does not hold the record, but a comparison of the sun, Sirius and Rigel does give us some idea of the great range that exists among the stars in their physical characteristics.

Time Table for February

Feb.	EST.	
2	5:16 p. m.	Full moon
3	3:00 p. m.	Jupiter in same direction as sun
5	1:55 a. m.	Algol at minimum
	4:47 a. m.	Moon passes Saturn
6	7:00 p. m.	Moon nearest, distance 228,850 miles
	9:10 p. m.	Moon passes Mars
7	10:42 p. m.	Algol at minimum
9	1:32 p. m.	Moon at last quarter
10	10:00 a. m.	Mercury farthest west of sun
	7:30 p. m.	Algol at minimum
13	4:25 p. m.	Algol at minimum
14	1:01 p. m.	Moon passes Mercury
	3:33 p. m.	Moon passes Venus
16	5:53 p. m.	New moon
22	1:00 p. m.	Moon farthest, distance 251,520 miles
24	8:52 p. m.	Moon in first quarter
25	3:40 a. m.	Algol at minimum
28	12:30 a. m.	Algol at minimum

Subtract one hour for CST, two hours for MST, and three for PST.

Science News Letter, January 28, 1950

linking of the eastern and midwestern coaxial cable systems, bringing 14 metropolitan areas into the coaxial cable and microwave relay chain, the Commission declares. Simultaneous networking of programs could make possible the viewing of a program by about one-third of the population of the country.

When the Commission came into being in 1934, standard broadcast was the only form of radio program service, and non-broadcast stations were few in number. Today the radio spectrum is crowded with about 50 different classes of stations engaged in radio communication. They represent more than 700,000 radio licenses and other authorizations, not including 200,000 associated mobile units. Even with the advent of FM (frequency modulation) and television broadcasting, non-broadcast stations outnumber program stations by about 36 to one.

FM service, the static-free type of ordinary radio programs, is available over almost all of the eastern half of the United States, over most of the west coast area, and in a number of cities and adjacent rural areas in the West. More than 100,000,000 people are now within range of FM stations. The past year was the first in which facsimile was operated on a commercial basis, FM stations being used.

Science News Letter, January 28, 1950

THE PRAIRIE TREK EXPEDITION FOR BOYS TO THE AMERICAN SOUTHWEST



Exploring and collecting in mountains and canyons by young naturalists, journalists, photographers. Staff known in school, camp, and museum circles. 22nd summer. Booklet. Interviewing candidates February 5-11, Hotel Roosevelt, New York City.

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RADIO

Video Growth Reported

OVER 3,000,000 television receivers are now in use, and 71 television stations are serving 42 cities and metropolitan districts, the Federal Communications Commission states in its annual report. "TV" network facilities link 24 cities.

In addition to these 71 stations, more than 200 television stations are in experimental operation. At the end of the fiscal year covered by the report, June 30, 1949, there were 175 experimental TV stations

licensed by the Commission and 30 outstanding construction permits.

Included in these figures were 136 relay stations operating in the microwave region and used primarily as television pick-up, television studio-transmitter link, and interim television intercity relay stations. Thanks to these relays, television is no longer limited by the horizon.

The principal development in the expansion of TV network facilities was the

ENGINEERING

Traffic Surveys Aided

➤ AN ELECTRONIC device, said to be the "most satisfactory method of making traffic surveys yet invented," has passed preliminary tests at the University of California at Los Angeles.

This device uses metallic detectors placed at three-foot intervals on the highway and connected to an electronic digital computer in the U. C. L. A. engineering department a mile away.

Sealed to the pavement with cover tape and rubber cement, the detectors appear as tar strips on the highway. As traversing cars pass over these strips they cause a contact between two elements and initiate an electric current. Speed of the vehicle is determined by the time interval it takes the front wheels to cover the distance between the two detectors.

From messages flashed by the electric current, the digital computer in the U. C. L. A. engineering laboratory sorts out the information and tallies it in the category desired.

Here is what the device will do: (1) record the speed of passing vehicles; (2) tell what lane they are in; (3) total the

number of vehicles in a given lane in a given period of time; (4) record the speed distribution in a selected lane during any hour of the day; (5) furnish other significant data about traffic flow in a particular area.

For example, on one of Los Angeles' foggiest nights recently, when visibility was at the pea-soup stage, 15 automobiles were clocked at more than 60 miles an hour in the curb lane on Wilshire Boulevard.

Previous methods employing electric timers and photo-electric cells often proved unsatisfactory because several cars passing in direct line with these devices recorded as a single vehicle.

Members of the U. C. L. A. engineering staff who designed the instrument do not at present see the device as a "robot traffic cop", but principally as a faithful recorder for traffic surveys, a handy instrument for planners in city traffic bureaus.

Responsible for the development of the new traffic device are H. R. Kaiser and Robert Bromberg, research engineers, who are credited with the original design; D. L. Gerlough, who contributed refinements; and Robert Reis, who was largely responsible for designing the metallic detectors.

Science News Letter, January 28, 1950

IT'S FUN TO LEARN A LANGUAGE By LINGUAPHONE

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CHEMISTRY

Substitutes Salvaged From Waste Products

➤ YOU may soon be carrying home groceries in a paper sack made from discarded railroad ties if current research proves commercially practical. And you will be chewing spearmint gum flavored with orange rinds.

Other substitutes which chemists are trying to salvage from waste: peach and almond flavor and rose scent from citrus fruit skins, cinnamon flavor from oat hulls, non-poisonous stock feed from poisonous tung nuts, feed from wood chips, cardboard from stalks and paper from grass.

All of these conversions have been made in the laboratory, although commercial application awaits further tests or development, said Dr. William M. Murray, Jr., director of Southern Research Institute, Birmingham, Ala.

The possibilities of finding a use for old railroad ties are enormous, Dr. Murray told the winter meeting of the Southern Association of Science and Industry. Ties and poles discarded by the railroads each year amount to 3,000,000 tons of raw wood pulp. This equals one-seventh the total annual wood pulp needs of the country's paper industry, he said.

Although the paper bags and wrapping paper made from railroad ties are somewhat

weaker than those made from new wood, he suggested that further study might find a way to raise the strength to the level of new wood paper. The ties used in the experiment were 22 years old.

Paper from grass would also greatly relieve the burden on our overtaxed wood pulp industry, he pointed out. After the grass, *Sericea Lespedeza*, has been harvested for stock feed, the stalks usually remain in the field unused. Several types of paper have been made experimentally from these stalks.

Describing the conservation value of research into ways of salvaging unused or wasted products, Dr. Murray said that the function of an institute like the one he heads is to "take in its front door what the farmer has thrown out the back door and try to make something useful from it."

Science News Letter, January 28, 1950

INVENTION

New Jack for Tire Changes Eliminates Elbow Grease

➤ PART of the work of changing a flat tire will be eliminated by a newly patented jack which does not require the expenditure of elbow grease. The jack raises the car by use of the car's own exhaust gases.

The jack looks something like a deflated footstool with a rubber hose attached. The other end of the hose is fastened on to the exhaust pipe, the car's engine is started, and it thereupon lifts itself off the ground.

The jack was invented by John H. Cox, of Seville, Ohio, and Ralph L. Miller of Akron, who assigned the patent to the Firestone Tire and Rubber Company. It received patent number 2,495,092.

Science News Letter, January 28, 1950

Words in Science— METHYL-ETHYL

➤ THAT part of chemistry known as organic chemistry has the carbon atom as a skeleton. This carbon skeleton does much to determine the physical properties of the compound.

The methyl group is the name given to the combination of the carbon atom and three hydrogen atoms. Ethyl is the name assigned to two carbon atoms and five hydrogen atoms.

Thus in organic chemistry, the carbon-hydrogen combinations build one on another. And when the methyl group is combined with a certain atom, methyl alcohol results. Methyl alcohol is sometimes used as a rubbing compound. It is, however, poisonous to drink. Ethyl alcohol, on the other hand, is the intoxicating part of alcohol beverages.

Science News Letter, January 28, 1950

PHYSICS-CHEMISTRY

Rain Making Debated

► A CONTROVERSY over the merits of artificial rain making is being generated as Congress gets set to consider a \$50,000,000 appropriation for research on rain making and sea water distillation as two possible methods of replenishing the West's inadequate water resources.

The original rain maker, Dr. Vincent Schaefer, of the General Electric Research Laboratory, Schenectady, N. Y., says that what he has seen in actual experiments in New Mexico, Idaho and Montana, "definitely indicates that the cloud seeding method of producing precipitation should help in the water resources problem of the 17 western states."

On the other hand, Dr. Harry Wexler, chief of the U. S. Weather Bureau's Special Scientific Services Division, says that "it has not been demonstrated that cloud seeding is a factor in producing a significant amount of precipitation and, therefore, it has not been demonstrated that cloud seeding would help in the water resources problem of the West."

Most experts agree that the 17 states of the West, except for the Columbia River Valley, face an increasing water supply problem, brought about by the growth of population and industry in those states.

Dr. Schaefer said he is generally in favor of such measures as the \$50,000,000 water resources bill, introduced by Sen. Joseph C. O'Mahoney of Wyoming, because very careful study and much more basic research is needed before cloud seeding can be counted on to help.

Precipitation occurs, he explained, when nature forms a critical amount of nuclei around which rain drops or snow flakes can form. General Electric research, he said, has shown that in some instances, nature does not produce enough of those nuclei and, therefore, clouds which could produce rain or snow evaporate back into the air.

"What we need to find out," he said, "is how many artificial nuclei we need, when we should use them, where and how often."

In some places in the West, said Dr. Schaefer, very tall clouds are built up. The tops of these clouds change to snow, but this snow is at such a high altitude that it streams off and eventually evaporates.

He said that cloud seeding might well increase the vital snow pack on the mountains of California. There are probably good cloud conditions around the Donner Pass and Soda Springs. He thought, however, that the clouds over Los Angeles would generally not be suitable for rain making.

Dr. Wexler, on the other hand, disputed the results of some of the General Electric experiments. He said that he checked the rainfall in New Mexico during the time cloud-seeding experiments were going on

near Albuquerque. He found that on days when the research team did not seed clouds there was rain over the state, and that also on days when there was seeding there was rain over the state. Dr. Wexler concluded that it is not possible to demonstrate whether cloud seeding helps at all.

Research on rain making was included in the O'Mahoney bill at the suggestion of California Senator Sheridan Downey. Sen. Downey said that Pasadena meteorologist Irving Krick said he could increase rainfall by seeding clouds with "silver" iodide particles tossed into the sky from ground generators.

Dr. Schaefer pointed out that announcement of the possibility of seeding clouds with silver iodide nuclei from ground generators had been made by General Electric early in 1947.

Science News Letter, January 28, 1950

ENGINEERING-METEOROLOGY

Knowing Climate Will Reduce Building Costs

► KNOWING the climate will help reduce building costs in some areas of the country.

Tyler S. Rogers, assistant to the executive vice president of the Owens Corning Fiberglas Corporation, told a conference on weather and the building industry that, with an accurate knowledge of climatic conditions in various areas of the country, it will not always be necessary to use expensive construction materials.

It is not sensible to use, he said, the same building materials in areas where it is arid as would be used where there are 30 inches of rain or six feet of snow.

The Weather Bureau has knowledge to impart to the building industry, Dr. Francis W. Reichelderfer, chief of the bureau, told the conference. He said that the vast amount of weather information, gathered through the years, in the government archives is worth more than all the Klondike's gold.

It is one of the aims of the Weather Bureau, he explained, to provide weather and climate information in a form that is useful to all kinds of industry.

Seven homes are being built in Austin, Texas, to test various kinds of heating and insulating materials, but there'll be nobody home but a bunch of testing instruments. Prof. F. E. Giesecke, told the conference of plans of the University of Texas to conduct research on structures in hot climates.

The experiments will measure heat flow and radiation in the seven homes for about three years.

The conference was conducted jointly

by the Building Research Advisory Board and the National Research Council.

Science News Letter, January 28, 1950

● RADIO

Saturday, February 4, 3:15 p.m., EST

"Adventures in Science" with Watson Davis, director of Science Service, over Columbia Broadcasting System.

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Cats

► IF cats grew to the size of dogs it seems highly likely that man would never have enticed them into domestication. For cats have never completely taken to civilization. Everyone who ever owned a cat has felt at times the vague stirrings of fear that he has a wild creature on his hands.

Just how the house cat descended from the ferocious wild cats which it so closely resembles is not at all clear. House cats are related to lions, tigers, leopards, pumas, jaguars, and wildcats, as a trip to the zoo clearly demonstrates.

Cats, large and small, wild and domestic, belong to the meat-eating, hunting animals. They are characterized by fine fur, long smooth tails, blunt snouts, and retractable claws. They move with a sinuous suppleness unsurpassed in the animal kingdom except possibly by the unique locomotion of snakes, although both cat fanciers and snake lovers will dispute the comparison.

Even the most pampered of house tabbies retains a strong strain of jungle wildness. Although it rarely is expressed against humans, the cat's ferocity is on ready tap if any of its natural enemies appear on the scene. Dogs, mice, and birds quickly convert the purring pet into a grim hunter.

Many people have tried to keep both cats and canaries. The experiment may last for a greater or lesser time, but it usually ends

some dark night when the family is away. The cat bides his time, and when prying human eyes are withdrawn the cat will do its utmost to make a meal of the canary.

It is thought that cats originated in Africa, and then made their way through Europe and Asia into the Western Hemisphere. Just where along the line the small cat was domesticated is not known. There are several species of small cats which have been more or less tamed into household pets.

There is our own *Felis domestica*, the domestic cat. Siamese cats are a distinct species, ~~although they have all the same qualities of personality and manner of our common cat.~~ The jungle cat of Africa and tropical Asia is not so good for domestication. Although small compared to lions and tigers, this animal is about twice the size of the ordinary cat.

Native American cats include cougar, jaguar, ocelot, lynx and bobcat. A very early, but now extinct, predecessor of these cats was the large and fierce sabretooth tiger which stabbed its victims to death with the large fang-like teeth curving downward from its upper jaw.

Science News Letter, January 28, 1950

PSYCHOLOGY

Test Shows Whether Child Has Musical Ability

► **WHETHER** it is worth spending money on music lessons for a child or whether it is a waste of effort and money, can be told by a new test developed.

Try these chords on your piano: first F, A, and D, then E, A, and C sharp. If your child can tell you which of the two chords is lower, he may be a budding Bach. If he cannot, he probably will profit more from playing baseball after school than from practicing on the piano. Chord comparison is one device used in the new test of musical talent.

The test was developed by Dr. Louis P. Thorpe, University of Southern California psychologist, and Dr. Harvey S. Whistler of Rubank, Inc., Music Publishers, Chicago.

You may think there is only one kind of musical talent—either you've got it or you haven't. It's not so. According to the authors of the test there are four kinds: being able to tell tunes apart, being able to tell notes apart, being able to tell rhythms apart, and being able to tell how many times the same note is played in a tune.

A child may have musical talent in all four of these, some or none, and his intelligence has practically nothing to do with it.

A scientific genius may be a musical moron. It is true that a mental giant can memorize a piece more quickly than can a less intelligent person, but no amount of note learning can help him carry a tune if he is tone deaf.

Science News Letter, January 28, 1950

ORNITHOLOGY

Young Hummingbirds Are Considerate of Parents

► **THE** hummingbird, smallest of warm-blooded animals, is an even more remarkable creature than has been generally known according to the first studies that have ever been made of this winged whirlwind's metabolism (energy interchanges) while in flight.

Hummingbirds have the highest metabolic rate for any resting organism, their metabolic range is greater than that of any other warm-blooded animal, and they have the ability to become almost completely torpid at night to conserve energy.

Further, the hummingbird young are quite considerate of their parents. In relation to size, an adult bird's food requirements are enormous, as a result of his huge expenditure of energy. He has a hard enough time getting enough food, all of which must be gathered during furious flight. The young, who weigh about as much as the adults (3 grams, about as much as a dime), maintain a very low metabolic rate and food requirement in order to reduce the burden of food-gathering placed on the parents.

These are some of the findings of Dr. Oliver P. Pearson, assistant curator of mammals at the Museum of Vertebrate Zoology at the University of California. Dr. Pearson was able to make measurements of the bird's metabolism in flight because of the ability of the bird to fly in a bell jar. An apparatus connected to the jar recorded the oxygen consumption of the bird, and this was a measure of metabolism.

Dr. Pearson found that the hummingbird's oxygen consumption is about 13 cubic centimeters per gram of body weight during the daytime. The average man consumes about 16 quarts per hour, but his metabolic rate is much lower. If his metabolic rate equalled the bird's, he would consume about 1,060 quarts per hour.

The scientist found that the bird's metabolic rate in flight was about six times that at rest. During his apparently voluntary evening torpor, the hummingbird loses all power of movement or feeling. In the morning he comes to life, as though from the dead, by some mechanism not understood.

Dr. Pearson also calculated that the cruising radius of the bird is about 385 miles. This bears on a question of dispute among bird experts, who disagree as to whether migrating hummingbirds can fly non-stop across the Gulf of Mexico or follow the land around it. The Gulf is more than 500 miles across. The radius of flight was calculated from metabolic rate, average speed in flight (50 miles per hour) and amount of fuel they carry (one gram of fat).

Science News Letter, January 28, 1950

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ECOLOGY OF HEALTH: The New York Academy of Medicine Institute on Public Health, 1947—E. H. L. Corwin, Ed.—*Commonwealth Fund*, 196 p., \$2.50. Papers presented before the Institute on Public Health including those by Franklin Bobbitt, Haven Emerson, and C. E. A. Winslow.

ELEMENTS OF DAIRYING—T. M. Olson—*Macmillan*, rev. ed., 708 p., illus., \$5.50. A practical guide to the three main phases of the industry: dairy cattle, dairy products, and dairy farming.

JANE'S ALL THE WORLD'S AIRCRAFT 1949-1950—Leonard Bridgman, Ed.—*McGraw-Hill*, approx. 400 p., illus., \$16.50. A standard reference which includes records of all the nations' air forces and a record of civil aviation. These records cover a span of one year and include such things as organization, names and addresses of aeronautical departments, and a directory of flying schools.

LABOR DICTIONARY: A Concise Compendium of Labor Information—Paul Hubert Casselman—*Philosophical Library*, 553 p., \$7.50. Contains nearly 2500 entries, including definitions of labor terms, biographical sketches of labor leaders and labor legislation acts.

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PROCEEDINGS OF THE INDIANA ACADEMY OF SCIENCE Vol. 58—E. St. Clair Gantz, Ed.—*Indiana Academy of Science*, 297 p., illus., paper, \$3.00. Contains abstracts of papers on anthropology, bacteriology, botany, chemistry, entomology, geology and geography. Presented before the Academy May 14 and 15, 1948.

ROUTE SURVEYING—Carl F. Meyer—*International*, 300 p., illus., \$6.00. A technical reference book including basic principles, practical applications, and many useful tables.

SHRUBS OF MICHIGAN—Cecil Billington—*Cranbrook Institute of Science*, 2nd ed., Bull. No. 20, 339 p., illus., \$4.50. A detailed study of Michigan shrubs.

WHAT TEACHERS SAY ABOUT CLASS SIZE—Ellsworth Tompkins—*Gov't. Printing Office*, Office of Education Circular No. 311, 45 p., illus., paper, 20 cents. A study of class size in relation to the teaching of English, social studies, and ninth and tenth grade mathematics in public high schools.

Science News Letter, January 28, 1950

CHEMISTRY

Rare Chemical, Selenium, Aiding Fundamental Studies

► **SELENIUM**, the "Mr. In-Between" of the chemical world, can be a valuable research tool in fundamental chemistry studies, according to Dr. James D. McCullough, associate professor of chemistry at the University of California at Los Angeles.

This element—rarer than uranium—is situated half way between the metals and the non-metals and displays the characteristics of both.

Although produced at the present time as a by-product of copper and sulfuric acid, selenium has little practical use except when used in small amounts in the making of photo-electric cells and rectifiers in AC-DC radio sets.

Dr. McCullough is excited about selenium because he thinks that an intensive study of its compounds may reveal information valuable to a fundamental understanding of general chemical structures.

Selenium's intermediate position in the family of elements gives it a distinct advantage in X-ray crystal structure studies. Lighter elements are more difficult to locate in molecular studies, while the heavier ones absorb the X-rays too strongly.

Elementary selenium exists in three forms, Dr. McCullough points out. Two forms of it, with a ring-like structure of eight atoms to a molecule, are red crystalline substances and in certain respects resemble sulfur. The other is in the form of a metal-like substance, the crystals of which are made up of chains of selenium atoms.

Science News Letter, January 28, 1950

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☛ **HOME STERILIZER** for the infant's formula is big enough to hold six ordinary nursing bottles and the device may also be used as a pressure cooker. For the latter purpose, it is used in the conventional manner except that a pressure of only three pounds is obtained.

Science News Letter, January 28, 1950

☛ **STRAIN TESTER** for rubber and rubber-like compounds is an electric device which measures elongation of a specimen at a definite time after a certain stress is applied. One use is in production and laboratory control, both of rubbers and plastics.

Science News Letter, January 28, 1950

☛ **MAGNETIC LEVEL** for iron workers sticks when placed on a pipe or beam, leaving both hands free for the job. This nine-inch light aluminum level has permanent magnets embedded in its flat faces that will hold it to any ferrous material.

Science News Letter, January 28, 1950

☛ **ANTI-FOG CHEMICAL** preparation will keep the bathroom mirror, the inside of window panes and the inner surface of automobile glass free from steam and fog. It makes an invisible film on the glass and does not interfere with vision.

Science News Letter, January 28, 1950

☛ **X-RAY TUBE**, shown in the picture, is said to be the smallest ever made and is



designed particularly for use in dental work. It has a stabilized, concentrated amount of radiation output, thus producing high contrast and good definition in the picture formed.

Science News Letter, January 28, 1950

☛ **RUBBER TREADS** for stairways in the home resemble carpeting in general appearance. They combine the durability and economy of rubber with the beauty of car-

peting, and are available in five colors to harmonize with a home's decorations.

Science News Letter, January 28, 1950

☛ **SHOE INSERT**, recently patented, is designed as an aid to workmen who are required to stand for long hours on ladders at their work. It is a relatively rigid plate, shaped to fit in the bottom of the shoe from the heel to near the toes.

Science News Letter, January 28, 1950

☛ **COMBINATION ELECTRIC FAN** for either heating or cooling has electric heating coils built into position behind the fan. By the flip of a switch, the coils are put into the circuit to heat the air delivered by the device.

Science News Letter, January 28, 1950

☛ **GLASS FIBER SKIS** for snow jumpers are molded of strong, tiny fibers and a plastic under heat and pressure. Twisting and warping, commonly associated with many wooden skis, are eliminated. The skis have increased stability because their steel edges bite into the snow.

Science News Letter, January 28, 1950

☛ **MINIATURE BROADCASTING** station, an electric device for home or other use, transmits through the air like a regular radio station. Its transmissions can be picked up by any radio receiver within 15 feet.

Science News Letter, January 28, 1950

Do You Know?

America's first coal-burning gas turbine locomotive is about ready for use.

Fire-resistant hydraulic fluid is now used in some airplanes.

Sea water contains uranium, used in atomic energy, but not in sufficient quantities to supply an economic amount.

Solar eclipses will occur on March 18 and Sept. 12 this year, and lunar eclipses on April 2 and Sept. 26.

California has 75 winter sports areas; 40 of them are in national forests, 33 are on private land within national forest boundaries, and two are in national parks.

The Yogo sapphire deposit in Montana, one of the most productive gem deposits in the United States in the past, is now being restudied for possible further production.

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